March 23, 1937. S. B. WRIGHT 2,074,446

TRANSMISSION REGULATION

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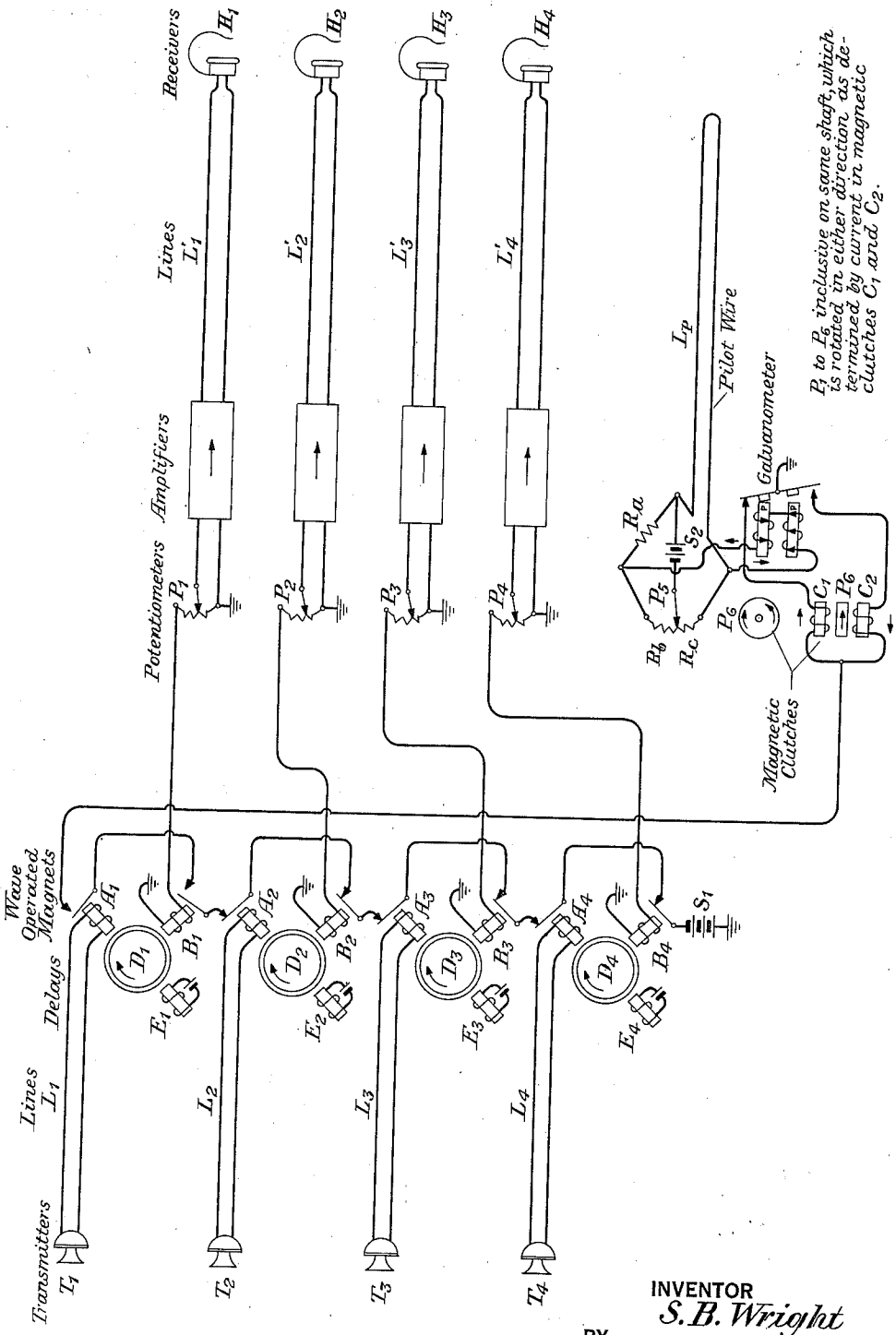

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TRANSMISSION REGULATION

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8 Claims. (Cl. 178—44)

This invention relates to a system for controlling circuit switching and other operations by wave controlled devices. One application of this principle is to control the operation of an automatic transmission regulator or gain changer although many other applications will readily suggest themselves.

It is well known in the art that telephone waves in one direction of transmission that are produced by conversation are not continuous but occupy only about one-third of the holding time. The other two-thirds is occupied by pauses between syllables and by answering from the distant end. In the transmission regulation system herein described the circuits are so arranged that the transmission regulation will take place only during intervals when no transmission is taking place over the circuits involved.

Transmission regulators, as heretofore devised, have involved the principle of adjusting the transmission level of the signaling channel whenever the transmission level departs more than a given amount from a normal desired level. A common mechanism for effecting this result is the so-called pilot regulator in which one of the channels of a group of channels is set aside as a pilot channel. Whenever the transmission conditions on this particular channel become abnormal, the pilot regulator becomes effective to make compensating adjustment upon each of the other channels of the group on the assumption that the same abnormal conditions apply to all of the channels.

In accordance with the present invention the pilot regulator is under the joint control of the pilot channel and the channels to be regulated. Each of the channels to be regulated is provided with an arrangement which will defeat the operation of the pilot regulator during such times as the signals are being transmitted over the channel. When an interval occurs, however, in which no signals are being transmitted over any of the channels to be regulated, the pilot regulator is released for operation. If the pilot channel indicates an abnormal transmission level the regulator operates to make the compensating adjustment.

This method of voice operated control can also be used to select quiet intervals for any other type of switching or circuit changing that might be desired. Furthermore, other types of signals such as telephoto or television signals can be used to operate the control. The drawing shows an application to the control of an automatic transmission regulator as an example of such other uses.

Further features and principles of the invention will be understood from the following description when read in connection with the accompanying drawing, the figure of which illustrates a preferred form of the invention.

In the drawing there are four wave transmitters, T_1, T_2, T_3 and T_4, capable of impressing signals on the lines, L_1, L_2, L_3 and L_4, which are connected to delay elements D_1, D_2, D_3 and D_4 through wave operated magnets A_1, A_2, A_3 and A_4. These delay elements may be magnetic recording tapes or other similar recording mechanisms. The output magnets B_1, B_2, B_3 and B_4 of the delay elements are connected to potentiometers P_1, P_2, P_3 and P_4 ahead of amplifiers which supply the regulated waves to other lines L'1, etc., and receiving devices H_1, etc. Magnets E_1, E_2, E_3 and E_4 are supplied with direct current so as to erase the patterns of the speech waves after they have been suitably delayed between the A and B magnets.

The four potentiometers are controlled by the operation of a magnetic clutch connected to their shaft, illustrated as P_6 with associated magnets C_1 and C_2. The magnets are supplied with battery S_1 through the contacts of the wave operated magnets and are supplied with ground by operation of a galvanometer connected to a Wheatstone bridge, one arm of which may be a line designated as a pilot wire.

Typical operation of transmission regulating systems is disclosed in detail elsewhere as, for example, in U. S. Patents Nos. 1,438,217 to 1,438,220, inclusive, issued to A. B. Clark. Briefly, increase in resistance of the pilot wire due to the temperature rising results in unbalancing the Wheatstone bridge so that current is fed from battery S_2 through the galvanometer which is operated in one direction or the other. In the drawing it is assumed that this operation causes ground to be applied to clutch magnet C_1, operation of which would cause the potentiometers to rotate in a clockwise direction. This rotation of the potentiometers associated with the repeaters would cause the gain in the circuit to increase, thereby compensating for the increased transmission loss due to the rising temperature. In addition, the movement of the potentiometer P_5 would transfer resistance from R_b to R_c, thereby balancing the bridge and putting the galvanometer in a neutral position, thus removing ground from the clutch. When the temperature decreases the action is similar except that clutch

C_2 is provided with ground necessary for its operation.

The magnetic clutches, however, require that battery S_1 be connected in order for the above operations to take place. In the drawing it is assumed that waves are traversing line L_1 and delay circuit D_1, thereby holding magnets A_1 and B_1 operated. Thus battery S_1 is not connected to the clutches and the shaft will not rotate even though the Wheatstone bridge be unbalanced and the ground connected to one clutch or the other.

As soon as the waves have passed the delay element D_1, and magnets A_1 and B_1 are consequently released, the battery connection is established and the shaft is caused to rotate. Wave transmission in any of the other lines would similarly hold up the operation until transmission in all circuits had ceased. This would improve the transmission in that adjustments of the gain would not be made at a time when waves were being transmitted over the circuit.

It will be obvious that the general principles herein disclosed may be embodied in many other organizations widely different from those illustrated without departing from the spirit of the invention as defined in the following claims.

What is claimed is:

1. In a signaling system, a signal transmission channel, a similar channel responsive to changes in the transmission level, means responsive to a change in the transmission level of said similar channel to restore the transmission level of said signal channel to normal, and means responsive to signal currents transmitted over the channel to prevent the operation of said restoring means.

2. In a signaling system, a plurality of more than two transmission channels, means to restore the transmission level of each of said channels to normal when the transmission level is abnormal, and means operating when signals are being transmitted over any of the channels to prevent the operation of said restoring means with respect to all of the channels.

3. In a signaling system, a plurality of more than two transmission channels subject to common influences which affect their transmission levels, one of said channels being used as a pilot channel, means controlled by said pilot channel for making compensating adjustments in the transmission levels of each of the other channels at times when an abnormal transmission condition exists in the pilot channel, and means operating when signals are being transmitted over any of the other channels to prevent the operation of said restoring means with respect to all of the channels.

4. In a signaling system, a plurality of more than two transmission channels subject to common influences which affect their transmission levels, one of said channels being used as a pilot channel, and means under the joint control of said pilot channel and each said other channels to make a compensating adjustment of the transmission levels of all of said channels when the transmission is abnormal.

5. In a signaling system, a plurality of more than two transmission channels subject to common influences which affect their transmission levels, one of said channels being used as a pilot channel, means controlled by said pilot channel for making compensating adjustments in the transmission levels of the other channels at times when an abnormal transmission condition exists in the pilot channel, and means jointly controlled by each of said other transmission channels to prevent the operation of said pilot controlled means when signals are being transmitted over said other channels.

6. In a signaling system, a plurality of more than two transmission channels subject to common influences which affect their transmission levels, one of said channels being used as a pilot channel, means controlled by said pilot channel for making compensating adjustments in the transmission levels of the other channels at times when an abnormal transmission condition exists in the pilot channel, and each of said other transmission channels having associated therewith means to prevent the operation of said pilot controlled means when signals are being transmitted over the channel.

7. In a signaling system in which a plurality of more than two signaling channels are so arranged that their transmission levels may be adjusted when an abnormal transmission condition exists in a common pilot channel, the method which consists in preventing a level adjustment in any of the channels until there is no energy above a predetermined value in any of the channels of the system.

8. In a signaling system in which a plurality of more than two signaling channels are so arranged that their transmission levels may be adjusted when an abnormal transmission condition exists in a common pilot channel, the method which consists in preventing a level adjustment in any of the channels until a condition occurs during which no signals are being transmitted over any of the channels of the system.

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